

November 1993 Highlights of the Light Ion Inertial Confinement Fusion Program

A significant effort in November involved preparing for a December 3 meeting to discuss options to reduce the ICF Program to fit within the budget. We may have to stretch delivery dates on our milestones because of the decreased budget. ICF presentations were given at the International Workshop on Atomic Physics for Ion-Driven Fusion and at the APS Division of Plasma Physics Meeting during November.

Analysis of two-stage diode shots on PBFA II indicates that on-axis lithium beam intensity was quite small. Optimization of the magnetic field geometry in the second stage with the TWOQUICK code should produce higher intensities on the next two-stage series. Ten shots were conducted with the large-area, large-gap “Pinocchio” ion diode. We generated our first 13-MeV lithium beam on PBFA II (see figure), and the beam was focused to $\sim 1 \text{ TW/cm}^2$. Spectroscopic data suggest lithium source divergence was reduced on the Pinocchio shots. The source divergence analysis will be completed in December.

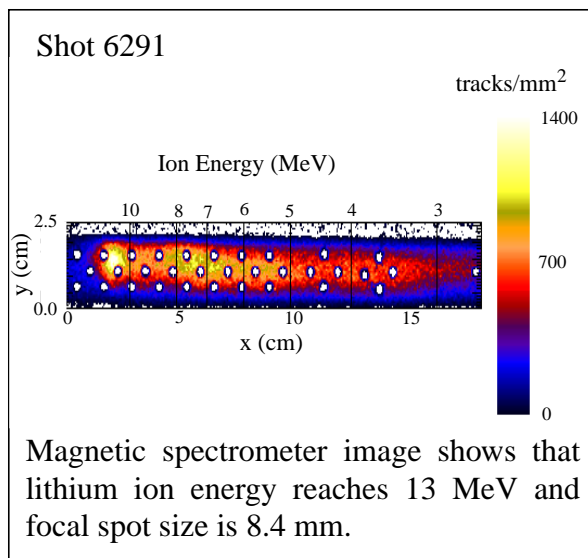
Objectives of the upcoming target series are to correlate hohlraum temperature and lithium intensity and to compare target behavior with hydrodynamic modeling. Work to provide improved diagnostics is proceeding. A cylindrical target with no bottom hole will allow use of a witness plate thermal diagnostic.

We analyzed the third series of internal-pulse-shaping target experiments on Nova. Flat witness plate shots were successful, but two of the wedge-shaped witness plate shots had low x-ray drive intensity and shorter drive duration than desired. Also, multiple shocks were not detected on the wedge-shaped shots.

Ten extraction diode shots, with a carnuba wax flashover source, and 28 low-voltage calibration shots were fired on SABRE. Spectral data collected now show intense C, O, and H lines during most of the power pulse. Improved bremsstrahlung shielding and vacuum alignment and good-quality MgF_2 -coated elliptical mirrors are responsible for these enhancements to the VUV spectroscopy. We are concentrating on anode plasma line width measurements for divergence studies.

The aluminum thickness in Gamble-II ion diode experiments at NRL with the exploding metal foil anode plasma source is being optimized. Aluminum is vaporized at lower current levels than expected.

A conceptual design review for the National Ignition Facility was held at LLNL. The baseline capacitor size has been selected. The target chamber radius is five meters, with a four-inch-thick aluminum wall. Design of three hohlraum characterization diagnostics is 60% complete.



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